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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,710	03/23/2004	Maurice Peter Bianchi	BO1 - 0341US	2668

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EXAMINER	
HALL, ASHA J	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/806,710	BIANCHI, MAURICE PETER	
	Examiner	**Art Unit**	
	ASHA HALL	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 March 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,5 and 7-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5 and 7-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 25, 2008 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 4, 5, 7-12, 15-18, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bour (EP 977,279) in view of Wu et al. ("Superior radiation resistance of InGaN alloys: Full solar spectrum photovoltaic material system", Journal of Applied Physics, volume 94, Issue 10, November 15, 2003) and Schetzina (US 5,679,965).

In regard to claim 1, Bour discloses a multi-junction solar cell assembly comprising: a transparent substrate/sapphire (405) as shown in Figure 5 (col.7; lines: 32-36); a transparent conductive coating formed on the transparent substrate (405), said transparent conductive coating comprising gallium nitride (410) (col.7; lines: 37-42);

a plurality of gallium indium nitride junction layers/quantum well active region (437) formed successively on the transparent conductive coating (col.8; lines: 16-19); and a metallization layer/electrode (450) formed on the plurality of gallium indium nitride junction layers (450, 440, & 435). Bour discloses group III-V nitrides that may be formed from an indium nitride junction layer (440) formed on the plurality of gallium indium nitride junction layers/quantum well active region (437) between the metallization layer (460) and the plurality of gallium indium nitride junction layers (435) (col.8; lines: 35-39). Bour fails to teach the use of indium nitride junction layer formed on the plurality of gallium indium nitride junction layer and wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Wu et al. discloses a photovoltaic material for multi-junction cells (column 1, paragraph 1, page 6477) and further discloses solar cells fabricate tunnel junctions out of p-type InN and InGaN (column1, last paragraph, page 6478) and (column 2, first paragraph, page 6478). Wu et al. teaches that InN has an energy band gap of 0.7eV and the band gap of InGaN alloys can be varied continuously from 0.7 to 3.4eV (paragraph 2 on page p.6477). Wu et al. further explains that this extends the range of the energy gaps of group III-nitride alloys from the deep ultraviolet to the practically very important near infrared spectral region and this spectral range provides an almost perfect fit to the solar spectrum, offering an unique opportunity to design multi-junction

solar cell using a single ternary alloy system (paragraph 2 on page p.6477). It would have been obvious to one of ordinary skill in the art at the time of the invention to employ InN and InGaN layer in multi-junction solar cell as taught by Wu et al. to the multi-junction solar cell of Bour in order to have a material with an energy band gap that offers a perfect fit to the solar spectrum and offering an unique opportunity to design multi-junction solar cell using a single ternary alloy system. Wu et al. in view of Bour fails to disclose wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Schetzina discloses a multiple quantum well semiconductor material composed of GaN layers (col.1; lines: 28-39) and further discloses wherein the multiple quantum *wells* has increasing thickness (emphasis on wells meaning more than one well/layer) and operates as a “pseudo-graded” layer to eliminate the band offset between the cladding layers and GaN (col. 14; lines: 67 - col. 15; lines: 1-5). It would have been obvious to one skilled in the art at the time of the invention to apply the graded (increasing thickness) of the layers MQW of Schetzina to the semiconductor device of modified Bour, in order to eliminate the band offset between the cladding layers and GaN.

With respect to claim 2, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein the transparent substrate is sapphire (405) as shown in Figure 5 (col.7; lines: 32-36).

With respect to claim 4, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, further comprising a gallium nitride junction layer (430) (col.8; lines: 32-34) formed on the transparent conductive coating (420) between the transparent conductive coating (420) and the plurality of gallium Indium nitride junction layers/quantum well active region (437) (col.8; lines; 7-10).

In regard to claim 5, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein each layer of the plurality of gallium indium nitride junction layers has a thickness of 1.0 microns (col.8; lines: 15-16).

In regard to claim 7, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein each layer of the plurality of gallium indium nitride junction layers has a gallium content of about 70 wt% and an indium content of 30 wt% (col.3; lines: 9-14).

With respect to claim 8, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein each successive layer of the plurality of gallium indium nitride junction layers has a gallium content less than the immediately preceding layer of the plurality of gallium indium nitride junction layers (437) and an indium content greater than the immediately preceding layer of the plurality of gallium indium nitride junction layers; wherein further comprising at least three gallium indium nitride junction layers as shown in Figure 5 and the group III-V nitrides may be formed from an gallium indium nitride junction layer (440, 450, 430) (col.8; lines: 35-39) formed on the plurality of gallium indium nitride junction layers/quantum well active region (437) between the metallization layer (460) and the plurality of gallium indium nitride junction layers (435).

In regard to claim 9, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein each layer of the plurality of gallium indium nitride junction layers has a band gap of 2.7eV (col.3; lines: 5-7).

With respect to claim 10, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein each successive layer of the plurality of gallium indium nitride junction layers has a band gap less than the band gap of the immediately preceding layer of the plurality of gallium indium nitride junction layers (col.3; lines: 5-13). Bour teaches that GaN is 3.4eV and InN is 1.9eV, and in order to obtain the band gap around 2.7eV, the In content needs to be 50%. Thereby teaching that as the In content decreases or increases so does the band gap energy (col.3; lines: 19-25).

In regard to claim 11, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein the transparent conductive coating comprises: a nucleation layer/buffer layer (310) formed on the transparent substrate; a lateral epitaxial overgrowth layer of gallium nitride formed nucleation layer (col.5; lines: 40-55); and a defect-free gallium nitride layer formed on the lateral epitaxial overgrowth layer (col.6; lines: 1-6).

With respect to claim 12, Bour discloses a multi-junction solar cell assembly in accordance with claim 11 above, wherein the nucleation layer/buffer comprises: an aluminum nitride coating formed directly on the transparent substrate in intimate contact with the transparent substrate; and a seed layer of gallium nitride formed on the aluminum nitride coating (col.6; lines: 1-6).

In regard to claim 15, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein the transparent conductive coating comprises a gallium nitride layer (410) as shown in Figure 5 formed on the transparent substrate (col.5; lines: 40-55).

With respect to claim 16, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, further comprising a metal current collector bus/electrode (460, 470 or 360,370) for receiving electrical power collected from the plurality of gallium indium nitride junction layers by the transparent conductive coating (col.6; lines: 55-58).

In regard to claim 17, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein said transparent substrate (405) /sapphire is entirely transparent to visible light/electromagnetic radiation (col.5; lines; 35-37).

With respect to claim 18, Bour discloses a multi-junction solar cell assembly in accordance with claim 1, wherein said transparent conductive coating (col.5; lines: 44-45) is entirely transparent to violet-blue light/electromagnetic radiation (col.3; lines: 26-35).

In regard to claim 22, Bour discloses a solar cell assembly comprising: a transparent substrate/sapphire (405) as shown in Figure 4 (col.7; lines: 32-36); a transparent conductive coating formed on the transparent substrate (405), said transparent conductive coating comprising gallium nitride (410) (col.7; lines: 37-42); a plurality of gallium indium nitride junction layers/quantum well active region (437) formed successively on the transparent conductive coating (col.8; lines: 16-19); and a

metallization layer/electrode (450) formed on the plurality of gallium indium nitride junction layers (450, 440, & 435). Bour discloses group III-V nitrides that may be formed from an indium nitride junction layer (440) formed on the plurality of gallium indium nitride junction layers/quantum well active region (437) between the metallization layer (460) and the plurality of gallium indium nitride junction layers (435) (col.8; lines: 35-39). Bour fails to teach the use of an indium nitride junction layer formed on the plurality of gallium indium nitride junction layer.

Wu et al. discloses a photovoltaic material for multi-junction cells (column 1, paragraph 1, page 6477) and further discloses solar cells fabricate tunnel junctions out of p-type InN and InGaN (column1, last paragraph, page 6478) and (column 2, first paragraph, page 6478). Wu et al. teaches that InN has an energy band gap of 0.7eV and the band gap of InGaN alloys can be varied continuously from 0.7 to 3.4eV (paragraph 2 on page p.6477). Wu et al. further explains that this extends the range of the energy gaps of group III-nitride alloys from the deep ultraviolet to the practically very important near infrared spectral region and this spectral range provides an almost perfect fit to the solar spectrum, offering an unique opportunity to design multi-junction solar cell using a single ternary alloy system (paragraph 2 on page p.6477). It would have been obvious to one of ordinary skill in the art at the time of the invention to employ InN and InGaN layer in multi-junction solar cell as taught by Wu et al. to the multi-junction solar cell of Bour in order to have a material with an energy band gap that offers a perfect fit to the solar spectrum and offering an unique opportunity to design multi-junction solar cell using a single ternary alloy system. Wu et al. in view of Bour

fails to disclose wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Schetzina discloses a multiple quantum well semiconductor material composed of GaN layers (col.1; lines: 28-39) and further discloses wherein the multiple quantum *wells* has increasing thickness (emphasis on wells meaning more than one well/layer) and operates as a “pseudo-graded” layer to eliminate the band offset between the cladding layers and GaN (col. 14; lines: 67 - col. 15; lines: 1-5). It would have been obvious to one skilled in the art at the time of the invention to apply the graded (increasing thickness) of the layers MQW of Schetzina to the semiconductor device of modified Bour, in order to eliminate the band offset between the cladding layers and GaN.

3. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bour (EP 977,279) and Wu et al. (“Superior radiation resistance of InGaN alloys: Full solar spectrum photovoltaic material system", Journal of Applied Physics, volume 94, Issue 10, November 15, 2003) as applied to claim 1 above, and in further view of Schetzina (6,046,464).

In regard to claim 13, modified Bour discloses a multi-junction solar cell assembly in accordance with claim 1 (Figure 5), but fails to discloses a multi-junction solar cell assembly in accordance with claim 1, wherein the transparent conductive coating comprises: a plurality of alternating layers of gallium nitride and aluminum gallium

nitride; and a plurality of quantum wells, each quantum well of the plurality of quantum wells formed at a corresponding interface between adjacent layers of gallium nitride and aluminum gallium nitride of the plurality of alternating layers of gallium nitride and aluminum gallium nitride.

Schetzina discloses multiple quantum well semiconductor material composed of InGaN and GaN layers as shown in Figures 9A-9C (col.10; lines: 36-40), and further discloses the transparent conductive coating comprises: a plurality of alternating layers of gallium nitride and aluminum gallium nitride (Figure 5); and a plurality of quantum wells (222b), each quantum well of the plurality of quantum wells formed at a corresponding interface between adjacent layers of gallium nitride and aluminum gallium nitride of the plurality of alternating layers of gallium nitride and aluminum gallium nitride (Figure 6A). Schetzina teaches that the energy barrier (conduction band offset) between the conduction bands can be eliminated by adding an intermediate layers that are doped and continuously graded to maintain an equilibrium Fermi energy level throughout the structure, thereby providing for a suitable ohmic contact (col. 13; lines: 1-17 and col.5; lines: 48-55). It would have been obvious to one skilled in the art at the time of the invention to apply the alternating layers of GaN and AlGaN of Schetzina to the semiconductor device of modified Bour, in order to eliminate the conduction band offset thereby creating a better ohmic contact within the device.

With respect to claim 14, modified Bour discloses a multi-junction solar cell assembly as applied to claim 13 above, wherein a first gallium indium nitride junction layer (InGaN) of the plurality of gallium indium nitride (InGaN) (435) junction layers is

formed directly on a last gallium nitride layer (GaN) (430) (col.10; lines: 7-8). Bour fails to disclose the plurality of alternating layers of gallium nitride (GaN) and aluminum gallium nitride (AlGaN) in intimate contact with a plurality of InGaN layers.

Schetzina discloses multiple quantum well semiconductor material composed of InGaN and GaN layers as shown in Figures 9A-9C (col.10; lines: 36-40), and further discloses the plurality of alternating layers of gallium nitride and aluminum gallium nitride in intimate contact with the last gallium nitride layer of the plurality of alternating layers of gallium nitride and aluminum gallium nitride (Figure 5). Schetzina teaches that the energy barrier (conduction band offset) between the conduction bands of AlGaN and GaN in the multiple quantum wells (MQW) can be eliminated by adding an intermediate layers that are doped and continuously graded to maintain an equilibrium Fermi energy level throughout the structure, thereby providing for a better ohmic contact (col. 13; lines: 1-17). It would have been obvious to one skilled in the art at the time of the invention to apply the alternating layers of GaN and AlGaN of Schetzina applied to the multiple quantum wells of InGaN of modified Bour, in order to eliminate the conduction band offset thereby creating a better ohmic contact within the device.

4. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bour (EP 977,279) in view of Nishii et al. (2003/0205721) and Schetzina (US 5,679,965).

In regard to claim 19, Bour discloses a multi-junction solar cell assembly comprising: a transparent substrate/sapphire (405) as shown in Figure 5 (col.7; lines: 32-36); a transparent conductive coating formed on the transparent substrate (405),

said transparent conductive coating comprising gallium nitride (410) (col.7; lines: 37-42); a plurality of gallium indium nitride junction layers/quantum well active region (437) formed successively on the transparent conductive coating (col.8; lines: 16-19); and a metallization layer/electrode (450) formed on the plurality of gallium indium nitride junction layers (450, 440, & 435). Bour fails to disclose wherein the metallization layer is selected from a group that includes a layer of aluminum, a layer of chromium, and a layer of titanium and each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Nishii et al. discloses semiconductor device composed of group III-nitride layers (paragraph 1), and further discloses the metallization layer including titanium pad electrode that is electrically connected to the device (paragraph 131). It would have been obvious to one of ordinary skill in the art at the time of the invention to employ titanium as the metallization layer as taught by Nishii et al. to the multi-junction solar cell of Bour in order to conduct electricity through the device.

Nishii et al. in view of Bour fails to disclose wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Schetzina discloses a multiple quantum well semiconductor material composed of GaN layers (col.1; lines: 28-39) and further discloses wherein the multiple quantum *wells* has increasing thickness (emphasis on wells meaning more than one well/layer) and operates as a “pseudo-graded” layer to eliminate the band offset between the cladding layers and GaN (col. 14; lines: 67 - col. 15; lines: 1-5). It would have been obvious to one skilled in the art at the time of the invention to apply the graded (increasing thickness) of the layers MQW of Schetzina to the semiconductor device of modified Bour, in order to eliminate the band offset between the cladding layers and GaN.

In regard to claim 20, Bour discloses a method as applied to claim 19 above, further comprising an indium nitride junction layer (440) formed on the plurality of gallium indium nitride junction layers/quantum well active region (437) between the metallization layer (460) and the plurality of gallium indium nitride junction layers (435) (col.8; lines: 35-39).

With respect to claim 21, Bour discloses a method as applied to claim 19 above, further comprising a gallium nitride junction layer (430) (col.8; lines: 32-34) formed on the transparent conductive coating (420) between the transparent conductive coating (420) and the plurality of gallium Indium nitride junction layers/quantum well active region (437) (col.8; lines; 7-10).

6. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takayama et al. (6,521,917) in view of Bour (EP 977,279) , Wu et al. (“Superior radiation resistance of InGaN alloys: Full solar spectrum photovoltaic material system",

Journal of Applied Physics, volume 94, Issue 10, November 15, 2003), and Schetzina (US 5,679,965).

With respect to claim 23, Takayama et al. discloses multi-junction solar cell assembly comprising: a substrate (100) having a first side and a second side opposite the first side; a metallization layer/electrode (140) formed on the first side of the substrate; a collector grid/cladding layer (105) formed on the second side of the substrate; a plurality of gallium indium nitride junction layers formed successively on the collector grid/cladding layer (105); and a glass cover/SiO2 (135) on the plurality of multiple quantum wells as shown in Figure 7E.

Takayama et al. fails to disclose that the multiple quantum wells are composed of gallium indium nitride layers and wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Bour discloses semiconductor device comprising: a transparent substrate/sapphire (405) as shown in Figure 4 (col.7; lines: 32-36); a transparent conductive coating formed on the transparent substrate (405), said transparent conductive coating comprising gallium nitride (410) (col.7; lines: 37-42); a plurality of gallium indium nitride junction layers/quantum well active region (437) formed successively on the transparent conductive coating (col.8; lines: 16-19); and a metallization layer/electrode (450) formed on the plurality of gallium indium nitride

junction layers (450) thru (435). Bour teaches that InGaN alloys span the visible spectrum, which will produce light in the blue region of the spectrum (col.7; lines: 7-13). It would have been obvious to one skilled in the art at the time of the invention to apply InGaN layers MQW of Bour to the semiconductor device of Takayama et al., in order to span the visible spectrum, which will produce light in the blue region of the spectrum. Bour discloses group III-V nitrides that may be formed from an indium nitride junction layer (440) formed on the plurality of gallium indium nitride junction layers/quantum well active region (437) between the metallization layer (460) and the plurality of gallium indium nitride junction layers (435) (col.8; lines: 35-39). Bour fails to teach the use of an indium nitride junction layer formed on the plurality of gallium indium nitride junction layer.

Wu et al. discloses a photovoltaic material for multi-junction cells (column 1, paragraph 1, page 6477) and further discloses solar cells fabricate tunnel junctions out of p-type InN and InGaN (column1, last paragraph, page 6478) and (column 2, first paragraph, page 6478). Wu et al. teaches that InN has an energy band gap of 0.7eV and the band gap of InGaN alloys can be varied continuously from 0.7 to 3.4eV (paragraph 2 on page p.6477). Wu et al. further explains that this extends the range of the energy gaps of group III-nitride alloys from the deep ultraviolet to the practically very important near infrared spectral region and this spectral range provides an almost perfect fit to the solar spectrum, offering an unique opportunity to design multi-junction solar cell using a single ternary alloy system (paragraph 2 on page p.6477). It would have been obvious to one of ordinary skill in the art at the time of the invention to

employ InN and InGaN layer in multi-junction solar cell as taught by Wu et al. to the modified multi-junction solar cell of Takayama et al. and Bour in order to have a material with an energy band gap that offers a perfect fit to the solar spectrum and offering an unique opportunity to design multi-junction solar cell using a single ternary alloy system.

Wu et al. in view of Bour fails to disclose wherein each successive gallium indium nitride junction laver has a thickness greater than a thickness of the immediately preceding gallium indium nitride junction layer, each successive gallium indium nitride junction layer being directly adjacent the immediately preceding gallium indium nitride junction layer.

Schetzina discloses a multiple quantum well semiconductor material composed of GaN layers (col.1; lines: 28-39) and further discloses wherein the multiple quantum *wells* has increasing thickness (emphasis on wells meaning more than one well/layer) and operates as a "pseudo-graded" layer to eliminate the band offset between the cladding layers and GaN (col. 14; lines: 67 - col. 15; lines: 1-5). It would have been obvious to one skilled in the art at the time of the invention to apply the graded (increasing thickness) of the layers MQW of Schetzina to the semiconductor device of modified Bour, in order to eliminate the band offset between the cladding layers and GaN.

Response to Arguments

Claim Rejection under 35 USC 103(a)

2. All arguments directed toward claims 1, 19, 22, and 23 as amended, require new grounds of rejection as presented above.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHA HALL whose telephone number is (571)272-9812. The examiner can normally be reached on Monday-Thursday 8:30-7:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AJH

/A. H./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795